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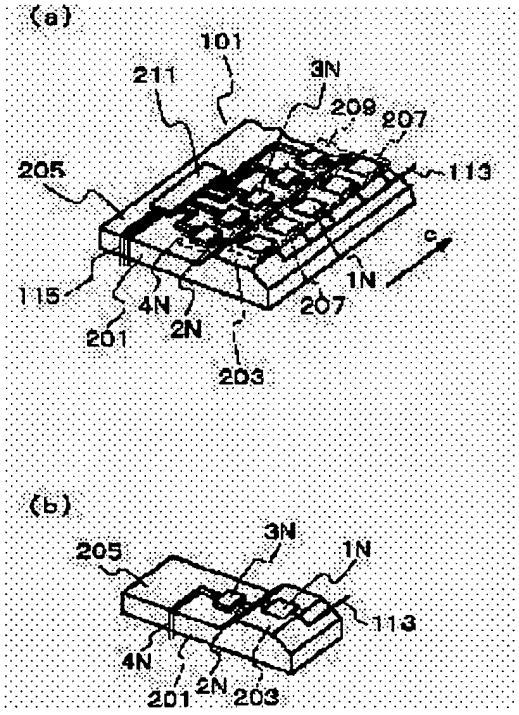
(54) DEVICE AND METHOD FOR INSPECTING ELECTRODE STRUCTURAL BODY FOR THIN-TYPE DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To speed up an inspection and to make inspection highly accurate by electrostatically coupling a potential sensor to each of a plurality of pixel electrodes, detecting pixel voltage generated at each pixel electrode, and determining anomalies of the pixel electrodes on the basis of the detected pixel voltage.

SOLUTION: For performing inspection through the use of a plurality of potential sensors IN arranged along the arrow (c), the potential sensors IN with FET function are each electrostatically coupled to one row or one column of plurality of pixel electrodes arranged as the elements of a matrix with n-rows and m-columns. The potential sensors IN detects pixel voltage generated at the pixel electrodes and determines inspection anomalies with respect to a threshold value set in advance. Potential sensor signals 2N from the electric sensors IN are connected to amplifiers 3N for amplification, and further the amplifiers 3N are connected to a scanner 211. A control part 107 sequentially switches and impresses the third signal 113, which is a command to



start inspection and is bias voltage, on the potential sensors IN. age The control part 107 impresses the second signal on the pixel electrodes as well.

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The inspection approach of the electrode structure for thin displays which detects the pixel electrical potential difference which is made to carry out the electrostatic coupling of the potential sensor which has field-effect transistor ability to each of two or more pixel electrodes, and is produced in said each electrode of a pixel, and is characterized by judging the abnormalities of said pixel electrode based on said detected pixel electrical potential difference.
[Claim 2] Test equipment which enforces the inspection approach of the electrode structure for thin displays according to claim 1 characterized by connecting to amplifier one or more potential sensors which detect the pixel electrical potential difference produced in said pixel electrode using the electric field effect TORAJISUTA function which carries out an electrostatic coupling to a pixel electrode, and coming to connect said amplifier with a scanner.
[Claim 3] In the Banking Inspection Department for inspecting the electrode structure for thin displays, and said Banking Inspection Department Two or more potential sensors using an FET function are arranged, and answer the 1st signal, and where the 1st spacing is held, said electrode structure for thin displays, and said some of Banking Inspection Department [at least] The mechanical component for making it move relatively and said electrode structure for thin displays about arrangement of a pixel electrode Said pixel electrode by which matrix arrangement is carried out is held in a n line m train (n and m are the natural number). Moreover, the orientation of two or more of said potential sensors, The line or the direction of a train in said matrix arrangement of said pixel electrode is in agreement, and the 4th signal which shows the inspection report of the pixel electrode which is a subject of examination is answered. The 2nd signal which outputs said 1st signal, and indicates an inspected initiation instruction to be said electrode structure for thin displays when said some of Banking Inspection Department [at least] moves relatively by one line or 1 train, Consist of the control section for outputting the 3rd signal which shows an inspection initiation instruction, and the pixel electrode which is the present subject of examination, or the pixel electrode contiguous to said pixel electrode by carrying out a sequential response to said 2nd signal Produce a pixel electrical potential difference one by one in said pixel electrode which is the present subject of examination, and the present potential sensor which carries out location opposite answers said pixel electrode which is said present subject of examination at said 3rd signal. Carry out sequential detection of said pixel electrical potential difference using an electrostatic coupling, carry out the sequential output of said 4th signal which shows the inspection report of the pixel electrode which is the present subject of examination, and said control section answers said 4th signal. Test equipment of the electrode structure for thin displays characterized by outputting said 2nd signal to the pixel electrode which is degree subject of examination, or the pixel electrode contiguous to said pixel electrode, and outputting said 3rd signal to the pixel electrode which is said degree subject of examination to the potential sensor which carries out location opposite.
[Claim 4] It is test equipment of the electrode structure for thin displays characterized by to consist of the amplifier for said potential sensor being equipped with the gate electrode for detecting the pixel electrical potential difference produced in a pixel electrode, and outputting a potential sensor signal to

the potential sensor using an FET function, and here by connecting electrostatic [which carry out location opposite with this potential sensor / the pixel electrode and electrostatic], amplifying said potential sensor signal, and outputting an amplifier signal.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the test equipment to the electrode structure for thin displays, and its inspection approach.
[0002]
[Description of the Prior Art] The thin indicating equipment is produced considering the display of TV, a personal computer, etc. as the application. As the evaluation approach for the electrode structure for these thin displays, a performance test, a reliability trial, an appearance test, etc. occur. Especially about the conventional lighting actuation verification test, it carries out after assembly **** as a product.
[0003] The inspection approach of the conventional electrode structure for thin displays is shown in drawing 8 . In this conventional example, the liquid crystal panel is made into the example for the electrode structure for thin displays. In addition, the electrode structure for thin displays defines this specification as what holds the pixel electrode arranged as a matrix element of a n line m train (n and m are an integer).
[0004] The inspection approach shown in drawing 8 is called a prober method. The gate voltage wiring 83 is formed on the substrate 86. These are formed in all directions between the elements 80 of a TFT mold transistor group, and are arranged.
[0005] This inspection approach contacts sensing pins (prober) 81 and 82 to the source electrical-potential-difference wiring 85 respectively, and inspects an open circuit of the pixel electrode 84, a short circuit, etc. by detecting the output voltage. That is, the defect of the pixel electrode 84 is detected by impressing an inspection signal to the gate voltage wiring 83 currently formed in the electrode structure for thin displays, and the source electrical-potential-difference wiring 85.
[0006]
[Problem(s) to be Solved by the Invention] The inspection approach of this prober method is faced with the problem that the number of poor contacts of a sensing pin increases, that exchange frequency increases with enlargement of the electrode structure for thin displays, and a sustaining cost increases as a result.
[0007] A liquid crystal display is combined with the enlargement and full-color-izing accompanying many quantification of the display information, and also its highly minute-ization, and contraction-ization of a pixel pitch is demanded. Therefore, the test equipment which the poor contact of test equipment does not occur but enables a high speed and highly precise inspection, and its inspection approach are wanted to offer immediately.
[0008] The purpose of this invention is to offer the test equipment and its inspection approach of the electrode structure for thin displays which enables improvement in the speed and highly-precise-izing of inspection.
[0009]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the test equipment and its inspection approach of the electrode structure for thin displays of this invention detect

the pixel electrical potential difference which is made to carry out the electrostatic coupling of the potential sensor which has field-effect transistor ability to each of two or more pixel electrodes, and is produced in said each electrode of a pixel, and are characterized by judging the abnormalities of said pixel electrode based on said detected pixel electrical potential difference.
[0010] Moreover, it is characterized by connecting to amplifier one or more potential sensors which detect the pixel electrical potential difference produced in said pixel electrode using the electric field effect TORAJISUTA function which carries out an electrostatic coupling to a pixel electrode, and coming to connect said amplifier with a scanner.
[0011] furthermore, in the Banking Inspection Department for inspecting the electrode structure for thin displays, and said Banking Inspection Department Two or more potential sensors using an FET function are arranged, and answer the 1st signal, and where the 1st spacing is held, said electrode structure for thin displays, and said some of Banking Inspection Department [at least] The mechanical component for making it move relatively by one line or 1 train and said electrode structure for thin displays about arrangement of a pixel electrode Said pixel electrode by which matrix arrangement is carried out is held in a n line m train (n and m are the natural number). Moreover, the orientation of two or more of said potential sensors, The line or the direction of a train in said matrix arrangement is in agreement, and the 4th signal which shows the inspection report of the pixel electrode which is a front subject of examination is answered. The 2nd signal which shows an inspected initiation instruction when said 1st signal is outputted and said electrode structure for thin displays and said some of Banking Inspection Department [at least] move relatively, Consist of the control section for outputting the 3rd signal which shows an inspection initiation instruction, and the pixel electrode which is the present subject of examination, or the pixel electrode contiguous to said pixel electrode by carrying out a sequential response to said 2nd signal Produce a pixel electrical potential difference one by one in said pixel electrode which is the present subject of examination, and the present potential sensor answers said 3rd signal in said Banking Inspection Department. Carry out sequential detection of said pixel electrical potential difference using an electrostatic coupling, carry out the sequential output of said 4th signal which shows the inspection report of the pixel electrode which is the present subject of examination, and said control section answers said 4th signal. It is characterized by being characterized by outputting said 2nd signal to the pixel electrode which is degree subject of examination, or the pixel electrode contiguous to said pixel electrode, and outputting said 3rd signal to the pixel electrode which is said degree subject of examination to the potential sensor which carries out location opposite.
[0012] Furthermore, it is characterized by to consist of the amplifier for said potential sensor being equipped with the gate electrode for detecting the pixel electrical potential difference produced in said pixel electrode, and outputting a potential sensor signal to the potential sensor using an FET function, and here by connecting electrostatic [which carry out location opposite with this potential sensor / the pixel electrode and electrostatic], amplifying said potential sensor signal here, and outputting an amplifier signal to them.
[0013]
[Embodiment of the Invention] Next, the test equipment and its inspection approach of the electrode structure for thin displays of this invention are explained to a detail with reference to an accompanying drawing. The gestalt of operation of the test equipment of the electrode structure for thin displays which is this invention is shown in drawing 1 . In addition, the gestalt of operation of this invention explains a liquid crystal panel for the electrode structure for thin displays to an example.
[0014]

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[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the test equipment and its inspection approach of the electrode structure for thin displays of this invention detect

the pixel electrical potential difference which is made to carry out the electrostatic coupling of the potential sensor which has field-effect transistor ability to each of two or more pixel electrodes, and is produced in said each electrode of a pixel, and are characterized by judging the abnormalities of said pixel electrode based on said detected pixel electrical potential difference.

[0010] Moreover, it is characterized by connecting to amplifier one or more potential sensors which detect the pixel electrical potential difference produced in said pixel electrode using the electric field effect TORAJISUTA function which carries out an electrostatic coupling to a pixel electrode, and coming to connect said amplifier with a scanner.

[0011] furthermore, in the Banking Inspection Department for inspecting the electrode structure for thin displays, and said Banking Inspection Department Two or more potential sensors using an FET function are arranged, and answer the 1st signal, and where the 1st spacing is held, said electrode structure for thin displays, and said some of Banking Inspection Department [at least] The mechanical component for making it move relatively by one line or 1 train and said electrode structure for thin displays about arrangement of a pixel electrode Said pixel electrode by which matrix arrangement is carried out is held in a n line m train (n and m are the natural number). Moreover, the orientation of two or more of said potential sensors, The line or the direction of a train in said matrix arrangement is in agreement, and the 4th signal which shows the inspection report of the pixel electrode which is a front subject of examination is answered. The 2nd signal which shows an inspected initiation instruction when said 1st signal is outputted and said electrode structure for thin displays and said some of Banking Inspection Department [at least] move relatively, Consist of the control section for outputting the 3rd signal which shows an inspection initiation instruction, and the pixel electrode which is the present subject of examination, or the pixel electrode contiguous to said pixel electrode by carrying out a sequential response to said 2nd signal Produce a pixel electrical potential difference one by one in said pixel electrode which is the present subject of examination, and the present potential sensor answers said 3rd signal in said Banking Inspection Department. Carry out sequential detection of said pixel electrical potential difference using an electrostatic coupling, carry out the sequential output of said 4th signal which shows the inspection report of the pixel electrode which is the present subject of examination, and said control section answers said 4th signal. It is characterized by being characterized by outputting said 2nd signal to the pixel electrode which is degree subject of examination, or the pixel electrode contiguous to said pixel electrode, and outputting said 3rd signal to the pixel electrode which is said degree subject of examination to the potential sensor which carries out location opposite.

[0012] Furthermore, it is characterized by to consist of the amplifier for said potential sensor being equipped with the gate electrode for detecting the pixel electrical potential difference produced in said pixel electrode, and outputting a potential sensor signal to the potential sensor using an FET function, and here by connecting electrostatic [which carry out location opposite with this potential sensor / the pixel electrode and electrostatic], amplifying said potential sensor signal here, and outputting an amplifier signal to them.

[0013]

[Embodiment of the Invention] Next, the test equipment and its inspection approach of the electrode structure for thin displays of this invention are explained to a detail with reference to an accompanying drawing. The gestalt of operation of the test equipment of the electrode structure for thin displays which is this invention is shown in drawing 1 . In addition, the gestalt of operation of this invention explains a liquid crystal panel for the electrode structure for thin displays to an example.

[0014] With reference to drawing 1 , this configuration consists of the Banking Inspection Department 101, and the mechanical component 105 and control section 107 for inspecting the electrode structure 103 for thin displays. The Banking Inspection Department 101 holds the electrode structure 103 for thin displays, and spacing d (the 1st spacing), and is stationed.

[0015] The electrode structure 103 for thin displays has held the pixel electrode arranged as a matrix element of a n line m train (n and m are an integer) (in drawing 1 , matrix arrangement is carried out in the direction of a of an arrow head, and the direction of b of an arrow head).

[0016] A control section 107 answers the 4th signal 115 which shows the inspection report of each pixel

electrode which is a subject of examination from the Banking Inspection Department 101, and outputs the 1st signal 109 for the Banking Inspection Department 101 and the electrode structure 103 for thin displays to make it move relatively by one line or 1 train about matrix arrangement of a pixel electrode.
[0017] Although mentioned later, this corresponds, when a control section 107 counts the count of an input of the 4th signal 115 related to one line or the number of pixel electrodes for one train.
[0018] Moreover, a control section 107 gives the 2nd signal 111 which shows an inspected initiation instruction to the electrode structure 103 for thin displays, when the Banking Inspection Department 101 and the electrode structure 103 for thin displays move relatively by one line or 1 train.
[0019] Although mentioned later, this impresses the 2nd signal 111 as a pulse voltage to the pixel electrode contiguous to the pixel electrode which the electrode structure 103 for thin displays holds and which is an inspected object, or its pixel electrode.
[0020] Furthermore, a control section 107 outputs the 3rd signal 113 which shows the inspection initiation instruction of the pixel electrode used as a subject of examination to the Banking Inspection Department 101. Although mentioned later, in order to operate separately two or more potential sensors which the Banking Inspection Department 101 holds, the 3rd signal 113 is impressed as bias voltage.
[0021] A mechanical component 105 answers the 1st signal 109 from a control section 107, and moves relatively the Banking Inspection Department 101 and the electrode structure 103 for thin displays by one line or 1 train about arrangement of a pixel electrode.
[0022] The Banking Inspection Department 101 answers the 3rd signal 113 from a control section 107, and outputs the 4th signal which shows the inspection report for every pixel electrode. Two or more potential sensors using two or more field-effect transistor (FET) functions are prepared for the Banking Inspection Department 101. About a concrete inspection of a pixel electrode, it mentions later.
[0023] Next, the configuration is shown in drawing 2 (a) about the Banking Inspection Department 101 in the test equipment of the electrode structure for thin displays of this invention. With reference to drawing 2 (a), as for this configuration, the high order section 203 and the lower order section 205 are formed in the substrate 201, referring to drawing 1 .
[0024] The potential sensor section 207 is formed in the high order section 203. The potential sensor section 207 is a sensor for potential detection by which two or more potential sensor 1Ns (N is the integer of 1 - n at an integer) using an FET function have been arranged a list and in the shape of an array in the direction of c of an arrow head at one train.
[0025] Each potential sensor 1N, one line or each pixel electrode for one train in the electrode structure 103 for thin displays shown in drawing 1 will be countered in location. And the pixel electrical potential difference which is the inspection initiation instruction from a control section 107 and which is produced in response to the 3rd signal 113 in the pixel electrode which carries out location opposite is detected, and 2 Ns (N is the integer of 1 - n at an integer) of potential sensor signals are outputted.
[0026] The amplifier section 209 is formed in the lower order section 205. The amplifier section 209 is the voltage amplification section which consists of two or more amplifier 3Ns (integer of N1-n). One amplifier 3N, it connects corresponding to one potential sensor 1N, 2 Ns of potential sensor signals from one potential sensor 1N are amplified, and 4 Ns of amplifier signals are outputted.
[0027] Furthermore, the scanner 211 is formed in the lower order section 205. It connects with the scanner 211 respectively, and an amplifier 3N output side terminal receives 4 Ns of amplifier signals, and carries out the sequential output of the 4th signal 115 which shows the inspection report of the pixel electrode which is a subject of examination.
[0028] In addition, wiring connects electrically respectively between potential sensor 1N, amplifier 3N and amplifier 3N, and a scanner 211. The wiring is formed on the field of the lower order section 205 as a wiring layer by the metal membrane forming method.
[0029] It scans making 1 N of potential sensor sections which are the Banking Inspection Department 101 which showed drawing 2 (a), or its part hold at the liquid crystal panel and fixed spacing (the 1st spacing d) in drawing 1 which are a subject of examination, and it becomes possible to inspect the total pixel electrode with which a liquid crystal panel holds an inspection report by carrying out a sequential output. In that case, the direction of a of an arrow head or the direction of b shown in drawing 1 , and the

direction (the 1st direction) of c of the arrow head shown in drawing 2 (a) are made in agreement.
[0030] The inspection process for every pixel in the electrode structure for thin displays by the potential sensor section 207 shown in drawing 3 at drawing 2 (a) is shown. With reference to drawing 3 , this Fig. shows signs (one pixel electrode 8 in the liquid crystal panel 6 which is the electrode structure for thin displays, and potential sensor of one piece 1N in the potential sensor section 207) that location opposite is carried out, referring to drawing 1 .
[0031] The liquid crystal panel 6 consists of a glass substrate 7 and a pixel electrode 8. The pixel electrode 8 is formed in the front face of a glass substrate 7. Here, spacing (the 1st spacing d) between a glass substrate 7 and 5Ns (N is the integer of 1 - n at an integer) of unit transistor layers is 20 micrometers or less.
[0032] This potential sensor 1N, an FET function is applied and 5 Ns of unit transistor layers are formed in the front face of the high order section 203 of the substrate 201 in drawing 2 (a). The drain lateral electrode D, the source lateral electrode S, and the gate lateral electrode G are formed in 5Ns of unit transistor layers. The 3rd signal 113 which is the direct-current bias voltage for performing an FET function is impressed to the drain lateral electrode D from a control section 107.
[0033] In this Fig., if the pixel electrode 8 is not disconnected when the 2nd signal 111 which shows the inspected instruction from a control section 107 is impressed to the pixel electrode 8, the pixel electrical potential difference of constant value arises in the pixel electrode 8.
[0034] Here, a current (2Ns of potential sensor signals) arises from a control section 107 between the drain lateral electrode D and the source lateral electrode S using an FET function by the 3rd signal 113 which shows an inspection initiation instruction being impressed to potential sensor 1N.
[0035] This is because it connects with the pixel electrode which carries out location opposite with this potential sensor with the gate lateral electrode G electrostatic through electrostatic capacity C in the space according to spacing d. Thereby, a pixel electrical potential difference is detected and 2 Ns of potential sensor signals are outputted. The electrical-potential-difference value or current value at that time is amplified by amplifier 3N in drawing 2 (a), and is outputted from a scanner 211.
[0036] This Fig. explains the inspection using two or more potential sensor 1Ns arranged in the direction (the 1st direction) of c of an arrow head as shown in drawing 2 (a), although one pixel and the potential sensor 1N relation of one piece are shown next.
[0037] In order to inspect the pixel electrode arranged in this case as a matrix element of a n line m train (n and m are an integer) with reference to drawing 2 (a), referring to drawing 1 , potential sensor 1N which has an FET function is combined with each of those one line or two or more pixel electrodes for one train electrostatic. Then, potential sensor 1N detects the pixel electrical potential difference produced in each pixel electrode, and the abnormalities in inspection are judged between the thresholds set up beforehand.
[0038] In addition, this detection device is connected to amplifier 3N for amplifying 2 Ns of potential sensor signals from 1 potential sensor 1Ns or more for detecting the pixel electrical potential difference produced in said pixel electrode using the FET function which makes an electrostatic coupling with a pixel electrode possible, and amplifier 3N is further connected to a scanner 211.
[0039] In this inspection process, to potential sensor 1N which carries out location opposite with the pixel electrode which is a subject of examination, a control section 107 will perform a sequential change-over, and will impress the 3rd signal 113 which is an inspection initiation instruction and is bias voltage. Moreover, also to the pixel electrode which is a subject of examination, a control section 107 will perform a sequential change-over, and will impress the 2nd signal which is an inspected initiation instruction and is a pulse voltage. The detail of these actuation is mentioned later.
[0040] In addition, the Banking Inspection Department (simple test unit) corresponding to one pixel which shows drawing 3 is shown in drawing 2 (b). This configuration consists of single potential sensor 1N using an FET function, and single amplifier 3N.
[0041] Potential sensor 1N and amplifier 3N are the same as that of what was shown in drawing 2 (a). Single potential sensor 1N, 2 Ns of potential sensor signals are outputted by connecting electrostatic with the gate lateral electrode G for detecting the pixel electrical potential difference produced in the

pixel electrode which carries out location opposite with potential sensor 1N of this single. Amplifier 3N, 2 Ns of potential sensor signals are amplified, and 4 Ns of amplifier signals are outputted.
[0042] Applying to the field expected to carry out potential detection of this simple test unit according to non-contact to the matter (body) which produces an electrical potential difference only irrespective of a partial inspection (for example, the field of only one line or one train is taken charge of and inspected) of the electrode structure for thin displays shown in drawing 1 is also considered.
[0043] Next, the inspection approach of the electrode structure for thin displays which is this invention is explained. With reference to the whole block diagram shown in introduction and drawing 1 , the outline of the inspection approach by test equipment is explained.
[0044] A control section 107 answers the 4th signal 115 which shows the inspection report about the pixel electrode which is a subject of examination, and outputs the 1st signal 109 which shows an instruction to displace relatively the potential sensor section 207 (drawing 2 (a)) which is the Banking Inspection Department 101 or its part, and the electrode structure 103 for thin displays by one line or 1 train about matrix arrangement of a pixel electrode.
[0045] When the timing which outputs this 1st signal 109 counts the count of an input of the 4th signal 115 and reaches a predetermined value until a control section 107 becomes a predetermined value depending on one line each or the number of pixel electrodes for one train each (field where the potential sensor section 207 inspects) about matrix arrangement of a pixel electrode, it outputs the 1st signal 109.
[0046] A mechanical component 105 answers the 1st signal 109, and moves relatively the potential sensor section 207 which is the Banking Inspection Department 101 or its part, and the electrode structure 103 for thin displays by one line or 1 train about matrix arrangement of a pixel electrode.
[0047] About this relative migration, the check of that migration can be substantially grasped by the transit time determined from pixel inter-electrode distance and a relative-displacement rate.
[0048] Then, a control section 107 outputs the 3rd signal 113 which shows an inspection initiation instruction to the Banking Inspection Department 101, when relative migration is performed. As mentioned above (drawing 3 R> 3), the 3rd signal 113 is the bias voltage for operating separately two or more potential sensor 1Ns held in the Banking Inspection Department 101.
[0049] Moreover, a control section 107 outputs the 2nd signal 111 which shows an inspected initiation instruction to the pixel electrode used as a subject of examination in the electrode structure 103 for thin displays. This 2nd signal 111 is a pulse voltage for a trial.
[0050] Next, referring to drawing 1 , after a control section 107 outputs the 3rd signal 113 and the 2nd signal 111 with reference to drawing 4 or subsequent ones, the 4th signal 115 is answered from the Banking Inspection Department 101, and a detail of operation is explained until it outputs the 1st signal 109 (it shifts to inspection of the pixel electrode held in the next line or the following train).
[0051] The physical relationship from the upper part in an inspection process with the potential sensor section 207 is indicated to be a liquid crystal panel 6 to drawing 4 as the electrode structure 103 for thin displays. In this Fig., only the potential sensor section 207 which are some Banking Inspection Department 101 is displayed.
[0052] With reference to drawing 4 , matrix arrangement of the pixel electrode in a liquid crystal panel 6 is carried out in all directions, the total number of pixels is nxm and each pixel electrode is shown by the address (NM). Here, N is the natural number of 1 to n, and M is the natural number of 1 to m.
[0053] The potential sensor section 207 is in the condition which held uniformly a liquid crystal panel 6 and spacing d (for example, less than 20 micrometers), and it is displaced relatively, performing inspection in the direction of a of an arrow head. As shown in this Fig., the pixel electrode (NM) is carrying out matrix arrangement at the n line m train, and the potential sensor (not shown) of the potential sensor section 207 should carry out location opposite, and shall be held in each pixel electrode of the vertical single tier of a liquid crystal panel 6.
[0054] The sectional view cut to the direction of a of an arrow head and parallel in drawing 4 is shown in drawing 5 . In addition, in drawing 4 and drawing 5 , it is omitting about the electric and mechanical connection to the 2nd signal 111 from a control section 107 shown in drawing 1 , the 3rd signal 113, and

a mechanical component 105.
[0055] Next, the actuation in which each pixel electrode answers the inspected instruction shown in drawing 1 from a control section 107 is shown in a detail using drawing 6 . Also in a **** Fig., it is omitting like drawing 4 and drawing 5 about the electric and mechanical connection to the 2nd signal 111 from a control section 107, the 3rd signal 113, and a mechanical component 105.
[0056] With reference to drawing 6 , M has stopped the potential sensor section 207 in the location of eye one train about the direction of a of an arrow head. As for pixel electrode (11) - (n1), the inspection location supports respectively each potential sensor elements 11-1n of this potential sensor section 207.
[0057] The concrete inspection routine to a pixel electrode is shown below. First, the 3rd signal 113 which is an inspection initiation instruction beforehand is impressed to the potential sensor 21. Thereby, the sensor ability of the potential sensor 21 will be in a standby condition. Next, the 2nd signal 111 which is an inspected instruction is impressed to the potential sensor 21 at the pixel electrode (11) which carries out location opposite.
[0058] If the 4th signal 115 whose potential sensor 21 is an inspection report from the Banking Inspection Department 101 by detecting the pixel electrical potential difference produced in a pixel electrode (11) can detect as output voltage wave W1 as shown in drawing 7 (a) at this time, a pixel electrode (11) will judge that it is normal. The comparative judgment function with this threshold can respond by preparing in the Banking Inspection Department 101 and a control section 107 etc.
[0059] If output wave W0 in which output voltage is less than judgment level including the signal value which is zero is detected as shown in drawing 7 (b) when output wave W1 shown in drawing 7 (a) cannot be detected temporarily namely, it will be judged that the pixel electrode (11) is in an open-circuit condition. This is the own open-circuit inspection of a pixel electrode (11) which is a subject of examination.
[0060] Next, shunt evaluation with the pixel electrode contiguous to a pixel electrode (11) is performed. Where the 3rd signal 113 is impressed to the potential sensor 21, the 2nd signal 111 is impressed to a pixel electrode (21).
[0061] If detectable as output voltage wave W1 as detects a pixel electrical potential difference and the 4th signal 115 which is an inspection report from the Banking Inspection Department 101 shows to drawing 7 (a) from the pixel electrode (11) whose potential sensor 21 is a subject of examination at this time, it will be judged that a pixel electrode (11) and a pixel electrode (21) are in a short circuit condition.
[0062] If output wave W0 [as / whose output voltage is zero] including the signal value which is less than judgment level is detected as shown in drawing 7 (b), a pixel electrode (11) and a pixel electrode (21) will judge that he has no short circuit.
[0063] The short circuit condition between a pixel electrode (11) and a pixel electrode (12) and between a pixel electrode (11) and a pixel electrode (22) can be inspected by impressing the 2nd signal 111 in drawing 6 like above-mentioned inspection routine also about the pixel electrode (12) and pixel electrode (22) contiguous to a pixel electrode (11).
[0064] By the above inspection approach, inspection of the existence of an open circuit of the pixel electrode (11) itself and the existence of the pixel inter-electrode short circuit which adjoins a pixel electrode (11) is attained.
[0065] Moreover, in process of inspection of the pixel electrode (11) which is this subject of examination, the potential sensor 21 answers the pixel electrical potential difference (not shown) produced in a pixel electrode (11), and outputs the potential sensor signal 21 (N is 1 in this case).
[0066] Moreover, into the Banking Inspection Department 101, amplifier 31 (N is 1 in this case) amplifies the potential sensor signal 21, and outputs the amplifier signal 41 (N is 1 in this case), and a sequential output is further carried out through a scanner 211 as the 4th signal 115 which shows an inspection report. As mentioned above, a control section 107 is the process of inspection of the pixel electrode (11) which is a subject of examination, and will have counted the 4th signal 115 4 times.
[0067] That is, the control section 107 sets up beforehand the count of an input of the 4th signal 115 of each pixel electrode unit which is a subject of examination by expression news etc., and it becomes

possible by carrying out the sequential count of the count of an input of the 4th signal 115 to shift to inspection of the pixel electrode (21) which is the following subject of examination, comparing with the count of an input corresponding to each pixel electrode. It depends for this count of an input on the location where each pixel electrode is arranged.

[0068] Next, inspection of the pixel electrode (21) which is a subject of examination is performed. First, a control section 107 checks having reached the count of an input (a pixel electrode (11) 4 times) set up beforehand about a pixel electrode (11), and performs inspection of the pixel electrode (21) which is a subject of examination.

[0069] First, this impresses the 3rd signal 113 to the potential sensor 22 which carries out location opposite at a pixel electrode (21), and a control section 107 is impressing the 2nd signal 111 to a pixel electrode (21).

[0070] Inspection of the existence of an open circuit of the pixel electrode (21) itself and the existence of the pixel inter-electrode short circuit which adjoins a pixel electrode (21) will be performed about inspection of the pixel electrode (21) which is a subject of examination as well as inspection of a pixel electrode (11), and a case.

[0071] It performs about the pixel electrode of the n directions of b of the arrow head which shows the above-mentioned inspection to drawing 6 . In addition to the count of an input of the 4th signal 115 of the pixel electrode unit mentioned above, a control section 107 counts the count of an accumulation input of the number of pixel electrodes (train unit) for one train (n pieces) here.

[0072] Then, the count of an accumulation input of a train unit is set up beforehand, the 4th signal 115 inputted into the last for one train is answered, and the potential sensor section 207 and a liquid crystal panel 6 output the 1st signal 109 for making it move relatively by one train. The count of an accumulation input of this train unit can respond by adding to the expression news which should store the count of an input of each previous pixel electrode unit etc.

[0073] The procedure of inspection mentioned above is as follows. First, the pixel electrode which is a current subject of examination, or the pixel electrode contiguous to this pixel electrode carries out a sequential response at the 2nd signal 111, and the pixel electrode which is a subject of examination is made to produce a pixel electrical potential difference one by one.

[0074] In the Banking Inspection Department 101, the potential sensor which carries out location opposite at the pixel electrode which is a subject of examination answers at said 3rd signal 113, and carries out sequential detection of the pixel electrical potential difference by the electrostatic coupling using an FET function. And in the Banking Inspection Department 101, the sequential output of the 4th signal 115 which shows the inspection report of the pixel electrode which is a subject of examination is carried out.

[0075] Then, according to the count of an input of the pixel electrode unit set up beforehand, a control section 107 answers the 4th signal 115, and carries out the sequential output of the 2nd signal 111 to the pixel electrode which is the following subject of examination, or the pixel electrode contiguous to a pixel electrode. Moreover, to the potential sensor which carries out location opposite, the 3rd signal 113 is outputted to the pixel electrode which is the following subject of examination.

[0076] The above procedure is performed to the pixel electrode of the direction of a train, and according to the count of an accumulation input of the train unit set up beforehand, the 4th signal 115 is answered, the 1st signal 109 is outputted, and it shifts to inspection of the pixel electrode held in the following train in operating a mechanical component 105.

[0077] This inspection routine enables it to inspect the liquid crystal panel 6 which holds the total number nxm individual of pixel electrodes by scanning the potential sensor section 207 which is the Banking Inspection Department 101 or its part in the direction of a of an arrow head.

[0078] In addition, although duplication is included with the gestalt of this operation in the shunt evaluation of the pixel electrode which is a subject of examination, it is also possible to perform inspection which avoids the duplication in shunt evaluation.

[0079] It is controlling not to perform impression of the pulse voltage to a pixel electrode (11) in the case of the shunt evaluation of the pixel electrode (21) which are after the shunt evaluation by this

impressing a pulse voltage (the 2nd signal 111) to a pixel electrode (21) in the case of the shunt evaluation of the pixel electrode (11) which is a subject of examination, next a subject of examination.
[0080] Moreover, although only the number corresponding to the pixel electrode for a vertical single tier in a liquid crystal panel 6 (n pieces) shall have held potential sensor 1N (integer of N1-n) with the gestalt of this operation as the potential sensor section 207 is shown in drawing 4 or drawing 6 It is also possible to hold the potential sensor corresponding to the pixel electrode for a horizontal single tier (m pieces) similarly, and to inspect in the direction of b shown in drawing 6 .
[0081] It is also possible to control by total pixel several n electrode xm to classify into two or more fields the field of the pixel electrode in a liquid crystal panel 6 by which matrix arrangement was carried out, to have only a number applicable to the field potential sensor section 207, and to scan only the field for inspection.
[0082]
[Effect of the Invention] The high speed and the highly precise inspection corresponding to enlargement of a thin display, full-color-izing, and highly-minute-izing are attained by the test equipment and its inspection approach of the electrode structure for thin displays which is this invention.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the block diagram showing the test equipment of the electrode structure for thin indicating equipments by this invention.
[Drawing 2] Drawing 2 (a) is an isometric projection Fig. to show the Banking Inspection Department by this invention. Drawing 2 (b) is an isometric projection Fig. to show the Banking Inspection Department (simple unit) by this invention.
[Drawing 3] Drawing 3 is the sectional view showing a liquid crystal panel and some inspection approaches of the Banking Inspection Department.
[Drawing 4] Drawing 4 is the top view showing the physical relationship of a liquid crystal panel and the Banking Inspection Department.
[Drawing 5] Drawing 5 is the transverse-plane sectional view of drawing 4 .
[Drawing 6] Drawing 6 is a top view for explaining the actuation which shows the inspection approach of the liquid crystal panel by this invention.
[Drawing 7] Drawing 7 (a) and (b) are graphs which show the example of a detection wave.
[Drawing 8] Drawing 8 is the isometric projection Fig. showing the conventional example.
[Description of Notations]
101 : Banking Inspection Department
103 : Electrode Structure for Thin Displays
105 : Mechanical Component
107 : Control Section
109 : 1st Signal
111 : 2nd Signal
113 : 3rd Signal
115 : 4th Signal
d : Spacing (the 1st spacing)
201 : Substrate
203 : High Order Section
205 : Lower Order Section
207 : Potential Sensor Section
209 : Amplifier Section
211 : Scanner
1N (integer of N1-n) : Potential sensor
2Ns (integer of N1-n) : Potential sensor signal
3Ns (integer of N1-n) : Amplifier
4Ns (integer of N1-n) : Amplifier signal
5Ns (integer of N1-n) : Unit transistor layer
6 : Liquid Crystal Panel
7 : Glass Substrate

8 Or M is (NM), Integer of N1-N, and Integer of1-M.
: Pixel electrode
C : Electrostatic capacity
D : Drain lateral electrode
S : Source lateral electrode
G : Gate lateral electrode
P : P-type semiconductor
N (or n) : N-type semiconductor
80 : Element of TFT Transistor Group
81 82 : Sensing pin
83 : Gate Voltage Wiring
84 : Pixel Electrode
85 : Source Electrical-Potential-Difference Wiring
86 : Substrate

[Translation done.]

* NOTICES *

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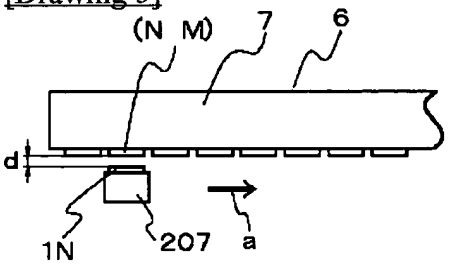
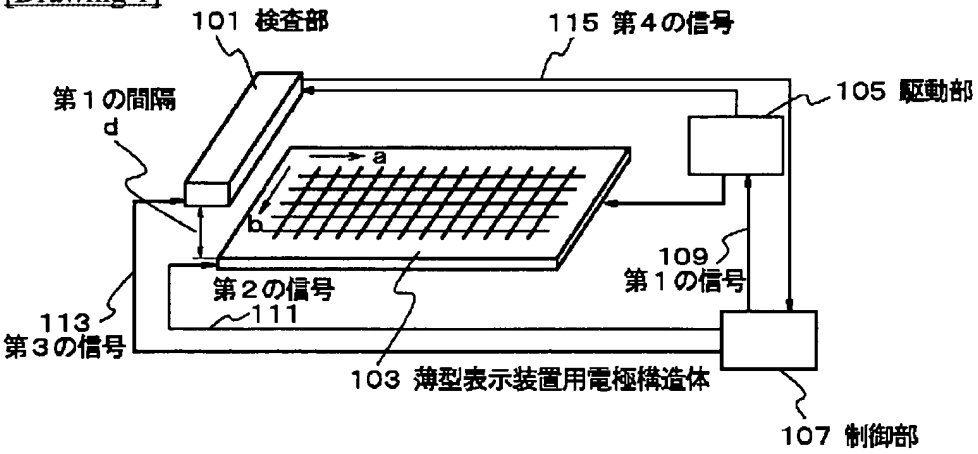
DRAWINGS

[Drawing 5]

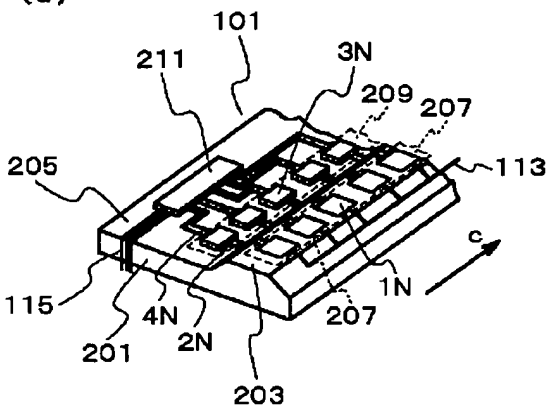


[Drawing 1]

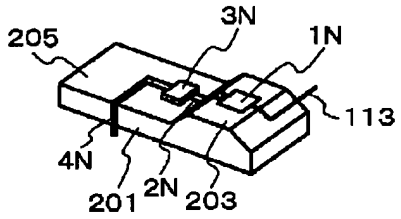


[Drawing 2]

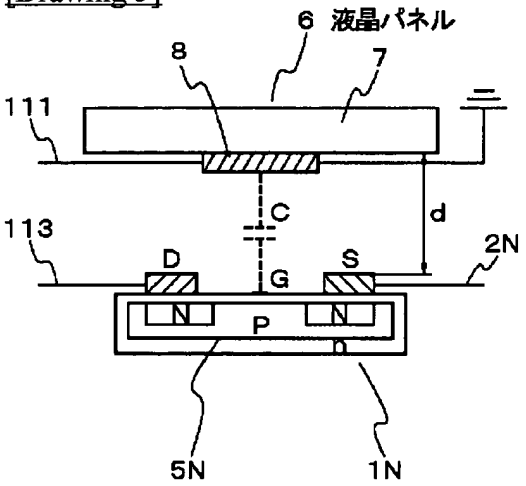
(a)



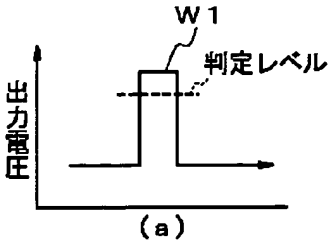
(b)

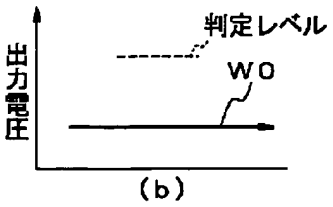


[Drawing 3]

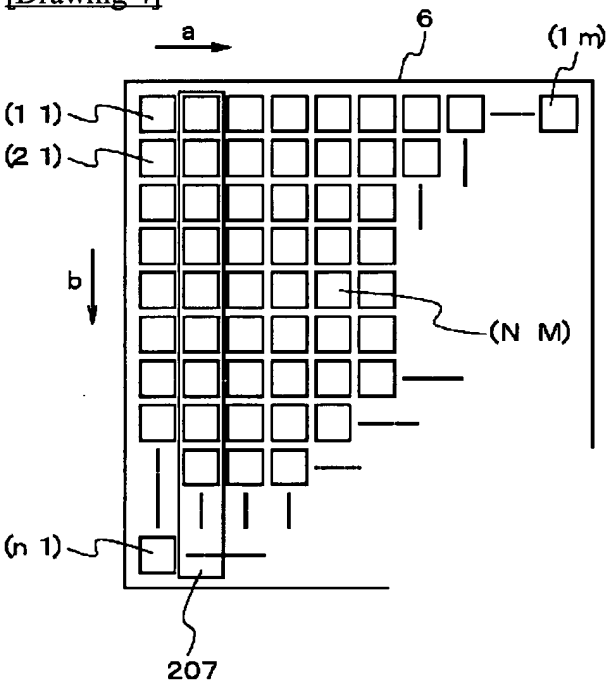


[Drawing 7]

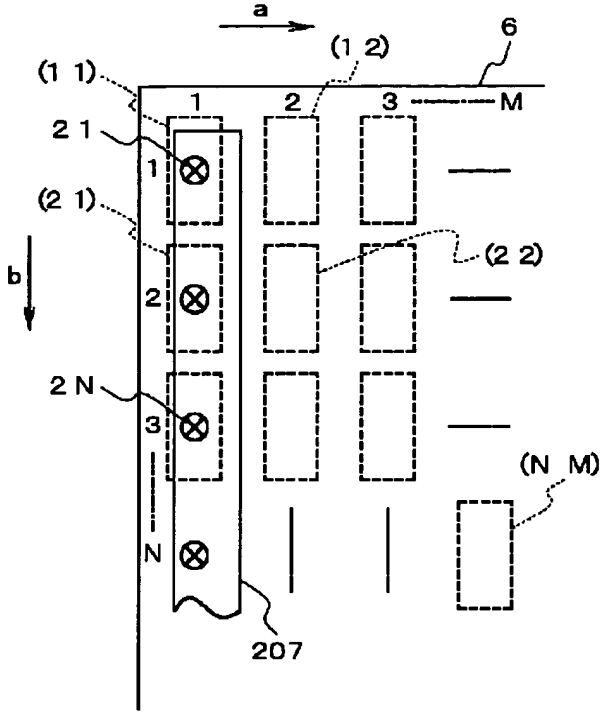




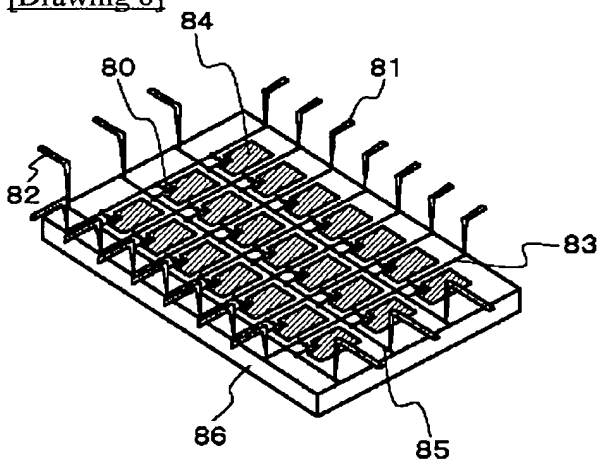
[Drawing 4]



[Drawing 6]



[Drawing 8]



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EFFECT OF THE INVENTION

[Effect of the Invention] The high speed and the highly precise inspection corresponding to enlargement of a thin display, full-color-izing, and highly-minute-izing are attained by the test equipment and its inspection approach of the electrode structure for thin displays which is this invention.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] The thin indicating equipment is produced considering the display of TV, a personal computer, etc. as the application. As the evaluation approach for the electrode structure for these thin displays, a performance test, a reliability trial, an appearance test, etc. occur. Especially about the conventional lighting actuation verification test, it carries out after assembly **** as a product.
[0003] The inspection approach of the conventional electrode structure for thin displays is shown in drawing 8 . In this conventional example, the liquid crystal panel is made into the example for the electrode structure for thin displays. In addition, the electrode structure for thin displays defines this specification as what holds the pixel electrode arranged as a matrix element of a n line m train (n and m are an integer).
[0004] The inspection approach shown in drawing 8 is called a prober method. The gate voltage wiring 83 is formed on the substrate 86. These are formed in all directions between the elements 80 of a TFT mold transistor group, and are arranged.
[0005] This inspection approach contacts sensing pins (prober) 81 and 82 to the source electrical-potential-difference wiring 85 respectively, and inspects an open circuit of the pixel electrode 84, a short circuit, etc. by detecting the output voltage. That is, the defect of the pixel electrode 84 is detected by impressing an inspection signal to the gate voltage wiring 83 currently formed in the electrode structure for thin displays, and the source electrical-potential-difference wiring 85.

[Translation done.]

JAPANESE [JP,2000-055964,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the test equipment and its inspection approach of the electrode structure for thin displays of this invention detect the pixel electrical potential difference which is made to carry out the electrostatic coupling of the potential sensor which has field-effect transistor ability to each of two or more pixel electrodes, and is produced in said each electrode of a pixel, and are characterized by judging the abnormalities of said pixel electrode based on said detected pixel electrical potential difference.
[0010] Moreover, it is characterized by connecting to amplifier one or more potential sensors which detect the pixel electrical potential difference produced in said pixel electrode using the electric field effect TORAJISUTA function which carries out an electrostatic coupling to a pixel electrode, and coming to connect said amplifier with a scanner.
[0011] furthermore, in the Banking Inspection Department for inspecting the electrode structure for thin displays, and said Banking Inspection Department Two or more potential sensors using an FET function are arranged, and answer the 1st signal, and where the 1st spacing is held, said electrode structure for thin displays, and said some of Banking Inspection Department [at least] The mechanical component for making it move relatively by one line or 1 train and said electrode structure for thin displays about arrangement of a pixel electrode Said pixel electrode by which matrix arrangement is carried out is held in a n line m train (n and m are the natural number). Moreover, the orientation of two or more of said potential sensors, The line or the direction of a train in said matrix arrangement is in agreement, and the 4th signal which shows the inspection report of the pixel electrode which is a front subject of examination is answered. The 2nd signal which shows an inspected initiation instruction when said 1st signal is outputted and said electrode structure for thin displays and said some of Banking Inspection Department [at least] move relatively, Consist of the control section for outputting the 3rd signal which shows an inspection initiation instruction, and the pixel electrode which is the present subject of examination, or the pixel electrode contiguous to said pixel electrode by carrying out a sequential response to said 2nd signal Produce a pixel electrical potential difference one by one in said pixel electrode which is the present subject of examination, and the present potential sensor answers said 3rd signal in said Banking Inspection Department. Carry out sequential detection of said pixel electrical potential difference using an electrostatic coupling, carry out the sequential output of said 4th signal which shows the inspection report of the pixel electrode which is the present subject of examination, and said control section answers said 4th signal. It is characterized by being characterized by outputting said 2nd signal to the pixel electrode which is degree subject of examination, or the pixel electrode contiguous to said pixel electrode, and outputting said 3rd signal to the pixel electrode which is said degree subject of examination to the potential sensor which carries out location opposite.
[0012] Furthermore, it is characterized by to consist of the amplifier for said potential sensor being equipped with the gate electrode for detecting the pixel electrical potential difference produced in said pixel electrode, and outputting a potential sensor signal to the potential sensor using an FET function, and here by connecting electrostatic [which carry out location opposite with this potential sensor / the pixel electrode and electrostatic], amplifying said potential sensor signal here, and outputting an

amplifier signal to them.
[0013]
[Embodiment of the Invention] Next, the test equipment and its inspection approach of the electrode structure for thin displays of this invention are explained to a detail with reference to an accompanying drawing. The gestalt of operation of the test equipment of the electrode structure for thin displays which is this invention is shown in drawing 1 . In addition, the gestalt of operation of this invention explains a liquid crystal panel for the electrode structure for thin displays to an example.
[0014] With reference to drawing 1 , this configuration consists of the Banking Inspection Department 101, and the mechanical component 105 and control section 107 for inspecting the electrode structure 103 for thin displays. The Banking Inspection Department 101 holds the electrode structure 103 for thin displays, and spacing d (the 1st spacing), and is stationed.
[0015] The electrode structure 103 for thin displays has held the pixel electrode arranged as a matrix element of a n line m train (n and m are an integer) (in drawing 1 , matrix arrangement is carried out in the direction of a of an arrow head, and the direction of b of an arrow head).
[0016] A control section 107 answers the 4th signal 115 which shows the inspection report of each pixel electrode which is a subject of examination from the Banking Inspection Department 101, and outputs the 1st signal 109 for the Banking Inspection Department 101 and the electrode structure 103 for thin displays to make it move relatively by one line or 1 train about matrix arrangement of a pixel electrode.
[0017] Although mentioned later, this corresponds, when a control section 107 counts the count of an input of the 4th signal 115 related to one line or the number of pixel electrodes for one train.
[0018] Moreover, a control section 107 gives the 2nd signal 111 which shows an inspected initiation instruction to the electrode structure 103 for thin displays, when the Banking Inspection Department 101 and the electrode structure 103 for thin displays move relatively by one line or 1 train.
[0019] Although mentioned later, this impresses the 2nd signal 111 as a pulse voltage to the pixel electrode contiguous to the pixel electrode which the electrode structure 103 for thin displays holds and which is an inspected object, or its pixel electrode.
[0020] Furthermore, a control section 107 outputs the 3rd signal 113 which shows the inspection initiation instruction of the pixel electrode used as a subject of examination to the Banking Inspection Department 101. Although mentioned later, in order to operate separately two or more potential sensors which the Banking Inspection Department 101 holds, the 3rd signal 113 is impressed as bias voltage.
[0021] A mechanical component 105 answers the 1st signal 109 from a control section 107, and moves relatively the Banking Inspection Department 101 and the electrode structure 103 for thin displays by one line or 1 train about arrangement of a pixel electrode.
[0022] The Banking Inspection Department 101 answers the 3rd signal 113 from a control section 107, and outputs the 4th signal which shows the inspection report for every pixel electrode. Two or more potential sensors using two or more field-effect transistor (FET) functions are prepared for the Banking Inspection Department 101. About a concrete inspection of a pixel electrode, it mentions later.
[0023] Next, the configuration is shown in drawing 2 (a) about the Banking Inspection Department 101 in the test equipment of the electrode structure for thin displays of this invention. With reference to drawing 2 (a), as for this configuration, the high order section 203 and the lower order section 205 are formed in the substrate 201, referring to drawing 1 .
[0024] The potential sensor section 207 is formed in the high order section 203. The potential sensor section 207 is a sensor for potential detection by which two or more potential sensor 1Ns (N is the integer of 1 - n at an integer) using an FET function have been arranged a list and in the shape of an array in the direction of c of an arrow head at one train.
[0025] Each potential sensor 1N, one line or each pixel electrode for one train in the electrode structure 103 for thin displays shown in drawing 1 will be countered in location. And the pixel electrical potential difference which is the inspection initiation instruction from a control section 107 and which is produced in response to the 3rd signal 113 in the pixel electrode which carries out location opposite is detected, and 2 Ns (N is the integer of 1 - n at an integer) of potential sensor signals are outputted.
[0026] The amplifier section 209 is formed in the lower order section 205. The amplifier section 209 is

the voltage amplification section which consists of two or more amplifier 3Ns (integer of N1-n). One amplifier 3N, it connects corresponding to one potential sensor 1N, 2 Ns of potential sensor signals from one potential sensor 1N are amplified, and 4 Ns of amplifier signals are outputted.
[0027] Furthermore, the scanner 211 is formed in the lower order section 205. It connects with the scanner 211 respectively, and an amplifier 3N output side terminal receives 4 Ns of amplifier signals, and carries out the sequential output of the 4th signal 115 which shows the inspection report of the pixel electrode which is a subject of examination.
[0028] In addition, wiring connects electrically respectively between potential sensor 1N, amplifier 3N and amplifier 3N, and a scanner 211. The wiring is formed on the field of the lower order section 205 as a wiring layer by the metal membrane forming method.
[0029] It scans making 1 N of potential sensor sections which are the Banking Inspection Department 101 which showed drawing 2 (a), or its part hold at the liquid crystal panel and fixed spacing (the 1st spacing d) in drawing 1 which are a subject of examination, and it becomes possible to inspect the total pixel electrode with which a liquid crystal panel holds an inspection report by carrying out a sequential output. In that case, the direction of a of an arrow head or the direction of b shown in drawing 1 , and the direction (the 1st direction) of c of the arrow head shown in drawing 2 (a) are made in agreement.
[0030] The inspection process for every pixel in the electrode structure for thin displays by the potential sensor section 207 shown in drawing 3 at drawing 2 (a) is shown. With reference to drawing 3 , this Fig. shows signs (one pixel electrode 8 in the liquid crystal panel 6 which is the electrode structure for thin displays, and potential sensor of one piece 1N in the potential sensor section 207) that location opposite is carried out, referring to drawing 1 .
[0031] The liquid crystal panel 6 consists of a glass substrate 7 and a pixel electrode 8. The pixel electrode 8 is formed in the front face of a glass substrate 7. Here, spacing (the 1st spacing d) between a glass substrate 7 and 5Ns (N is the integer of 1 - n at an integer) of unit transistor layers is 20 micrometers or less.
[0032] This potential sensor 1N, an FET function is applied and 5 Ns of unit transistor layers are formed in the front face of the high order section 203 of the substrate 201 in drawing 2 (a). The drain lateral electrode D, the source lateral electrode S, and the gate lateral electrode G are formed in 5Ns of unit transistor layers. The 3rd signal 113 which is the direct-current bias voltage for performing an FET function is impressed to the drain lateral electrode D from a control section 107.
[0033] In this Fig., if the pixel electrode 8 is not disconnected when the 2nd signal 111 which shows the inspected instruction from a control section 107 is impressed to the pixel electrode 8, the pixel electrical potential difference of constant value arises in the pixel electrode 8.
[0034] Here, a current (2Ns of potential sensor signals) arises from a control section 107 between the drain lateral electrode D and the source lateral electrode S using an FET function by the 3rd signal 113 which shows an inspection initiation instruction being impressed to potential sensor 1N.
[0035] This is because it connects with the pixel electrode which carries out location opposite with this potential sensor with the gate lateral electrode G electrostatic through electrostatic capacity C in the space according to spacing d. Thereby, a pixel electrical potential difference is detected and 2 Ns of potential sensor signals are outputted. The electrical-potential-difference value or current value at that time is amplified by amplifier 3N in drawing 2 (a), and is outputted from a scanner 211.
[0036] This Fig. explains the inspection using two or more potential sensor 1Ns arranged in the direction (the 1st direction) of c of an arrow head as shown in drawing 2 (a), although one pixel and the potential sensor 1N relation of one piece are shown next.
[0037] In order to inspect the pixel electrode arranged in this case as a matrix element of a n line m train (n and m are an integer) with reference to drawing 2 (a), referring to drawing 1 , potential sensor 1N which has an FET function is combined with each of those one line or two or more pixel electrodes for one train electrostatic. Then, potential sensor 1N detects the pixel electrical potential difference produced in each pixel electrode, and the abnormalities in inspection are judged between the thresholds set up beforehand.
[0038] In addition, this detection device is connected to amplifier 3N for amplifying 2 Ns of potential

sensor signals from 1 potential sensor 1Ns or more for detecting the pixel electrical potential difference produced in said pixel electrode using the FET function which makes an electrostatic coupling with a pixel electrode possible, and amplifier 3N is further connected to a scanner 211.
[0039] In this inspection process, to potential sensor 1N which carries out location opposite with the pixel electrode which is a subject of examination, a control section 107 will perform a sequential change-over, and will impress the 3rd signal 113 which is an inspection initiation instruction and is bias voltage. Moreover, also to the pixel electrode which is a subject of examination, a control section 107 will perform a sequential change-over, and will impress the 2nd signal which is an inspected initiation instruction and is a pulse voltage. The detail of these actuation is mentioned later.
[0040] In addition, the Banking Inspection Department (simple test unit) corresponding to one pixel which shows drawing 3 is shown in drawing 2 (b). This configuration consists of single potential sensor 1N using an FET function, and single amplifier 3N.
[0041] Potential sensor 1N and amplifier 3N are the same as that of what was shown in drawing 2 (a). Single potential sensor 1N, 2 Ns of potential sensor signals are outputted by connecting electrostatic with the gate lateral electrode G for detecting the pixel electrical potential difference produced in the pixel electrode which carries out location opposite with potential sensor 1N of this single. Amplifier 3N, 2 Ns of potential sensor signals are amplified, and 4 Ns of amplifier signals are outputted.
[0042] Applying to the field expected to carry out potential detection of this simple test unit according to non-contact to the matter (body) which produces an electrical potential difference only irrespective of a partial inspection (for example, the field of only one line or one train is taken charge of and inspected) of the electrode structure for thin displays shown in drawing 1 is also considered.
[0043] Next, the inspection approach of the electrode structure for thin displays which is this invention is explained. With reference to the whole block diagram shown in introduction and drawing 1 , the outline of the inspection approach by test equipment is explained.
[0044] A control section 107 answers the 4th signal 115 which shows the inspection report about the pixel electrode which is a subject of examination, and outputs the 1st signal 109 which shows an instruction to displace relatively the potential sensor section 207 (drawing 2 (a)) which is the Banking Inspection Department 101 or its part, and the electrode structure 103 for thin displays by one line or 1 train about matrix arrangement of a pixel electrode.
[0045] When the timing which outputs this 1st signal 109 counts the count of an input of the 4th signal 115 and reaches a predetermined value until a control section 107 becomes a predetermined value depending on one line each or the number of pixel electrodes for one train each (field where the potential sensor section 207 inspects) about matrix arrangement of a pixel electrode, it outputs the 1st signal 109.
[0046] A mechanical component 105 answers the 1st signal 109, and moves relatively the potential sensor section 207 which is the Banking Inspection Department 101 or its part, and the electrode structure 103 for thin displays by one line or 1 train about matrix arrangement of a pixel electrode.
[0047] About this relative migration, the check of that migration can be substantially grasped by the transit time determined from pixel inter-electrode distance and a relative-displacement rate.
[0048] Then, a control section 107 outputs the 3rd signal 113 which shows an inspection initiation instruction to the Banking Inspection Department 101, when relative migration is performed. As mentioned above (drawing 3 R> 3), the 3rd signal 113 is the bias voltage for operating separately two or more potential sensor 1Ns held in the Banking Inspection Department 101.
[0049] Moreover, a control section 107 outputs the 2nd signal 111 which shows an inspected initiation instruction to the pixel electrode used as a subject of examination in the electrode structure 103 for thin displays. This 2nd signal 111 is a pulse voltage for a trial.
[0050] Next, referring to drawing 1 , after a control section 107 outputs the 3rd signal 113 and the 2nd signal 111 with reference to drawing 4 or subsequent ones, the 4th signal 115 is answered from the Banking Inspection Department 101, and a detail of operation is explained until it outputs the 1st signal 109 (it shifts to inspection of the pixel electrode held in the next line or the following train).
[0051] The physical relationship from the upper part in an inspection process with the potential sensor

section 207 is indicated to be a liquid crystal panel 6 to drawing 4 as the electrode structure 103 for thin displays. In this Fig., only the potential sensor section 207 which are some Banking Inspection Department 101 is displayed.

[0052] With reference to drawing 4 , matrix arrangement of the pixel electrode in a liquid crystal panel 6 is carried out in all directions, the total number of pixels is nxm and each pixel electrode is shown by the address (NM). Here, N is the natural number of 1 to n, and M is the natural number of 1 to m.

[0053] The potential sensor section 207 is in the condition which held uniformly a liquid crystal panel 6 and spacing d (for example, less than 20 micrometers), and it is displaced relatively, performing inspection in the direction of a of an arrow head. As shown in this Fig., the pixel electrode (NM) is carrying out matrix arrangement at the n line m train, and the potential sensor (not shown) of the potential sensor section 207 should carry out location opposite, and shall be held in each pixel electrode of the vertical single tier of a liquid crystal panel 6.

[0054] The sectional view cut to the direction of a of an arrow head and parallel in drawing 4 is shown in drawing 5 . In addition, in drawing 4 and drawing 5 , it is omitting about the electric and mechanical connection to the 2nd signal 111 from a control section 107 shown in drawing 1 , the 3rd signal 113, and a mechanical component 105.

[0055] Next, the actuation in which each pixel electrode answers the inspected instruction shown in drawing 1 from a control section 107 is shown in a detail using drawing 6 . Also in a **** Fig., it is omitting like drawing 4 and drawing 5 about the electric and mechanical connection to the 2nd signal 111 from a control section 107, the 3rd signal 113, and a mechanical component 105.

[0056] With reference to drawing 6 , M has stopped the potential sensor section 207 in the location of eye one train about the direction of a of an arrow head. As for pixel electrode (11) - (n1), the inspection location supports respectively each potential sensor elements 11-1n of this potential sensor section 207.

[0057] The concrete inspection routine to a pixel electrode is shown below. First, the 3rd signal 113 which is an inspection initiation instruction beforehand is impressed to the potential sensor 21. Thereby, the sensor ability of the potential sensor 21 will be in a standby condition. Next, the 2nd signal 111 which is an inspected instruction is impressed to the potential sensor 21 at the pixel electrode (11) which carries out location opposite.

[0058] If the 4th signal 115 whose potential sensor 21 is an inspection report from the Banking Inspection Department 101 by detecting the pixel electrical potential difference produced in a pixel electrode (11) can detect as output voltage wave W1 as shown in drawing 7 (a) at this time, a pixel electrode (11) will judge that it is normal. The comparative judgment function with this threshold can respond by preparing in the Banking Inspection Department 101 and a control section 107 etc.

[0059] If output wave W0 in which output voltage is less than judgment level including the signal value which is zero is detected as shown in drawing 7 (b) when output wave W1 shown in drawing 7 (a) cannot be detected temporarily namely, it will be judged that the pixel electrode (11) is in an open-circuit condition. This is the own open-circuit inspection of a pixel electrode (11) which is a subject of examination.

[0060] Next, shunt evaluation with the pixel electrode contiguous to a pixel electrode (11) is performed. Where the 3rd signal 113 is impressed to the potential sensor 21, the 2nd signal 111 is impressed to a pixel electrode (21).

[0061] If detectable as output voltage wave W1 as detects a pixel electrical potential difference and the 4th signal 115 which is an inspection report from the Banking Inspection Department 101 shows to drawing 7 (a) from the pixel electrode (11) whose potential sensor 21 is a subject of examination at this time, it will be judged that a pixel electrode (11) and a pixel electrode (21) are in a short circuit condition.

[0062] If output wave W0 [as / whose output voltage is zero] including the signal value which is less than judgment level is detected as shown in drawing 7 (b), a pixel electrode (11) and a pixel electrode (21) will judge that he has no short circuit.

[0063] The short circuit condition between a pixel electrode (11) and a pixel electrode (12) and between a pixel electrode (11) and a pixel electrode (22) can be inspected by impressing the 2nd signal 111 in

drawing 6 like above-mentioned inspection routine also about the pixel electrode (12) and pixel electrode (22) contiguous to a pixel electrode (11).
[0064] By the above inspection approach, inspection of the existence of an open circuit of the pixel electrode (11) itself and the existence of the pixel inter-electrode short circuit which adjoins a pixel electrode (11) is attained.
[0065] Moreover, in process of inspection of the pixel electrode (11) which is this subject of examination, the potential sensor 21 answers the pixel electrical potential difference (not shown) produced in a pixel electrode (11), and outputs the potential sensor signal 21 (N is 1 in this case).
[0066] Moreover, into the Banking Inspection Department 101, amplifier 31 (N is 1 in this case) amplifies the potential sensor signal 21, and outputs the amplifier signal 41 (N is 1 in this case), and a sequential output is further carried out through a scanner 211 as the 4th signal 115 which shows an inspection report. As mentioned above, a control section 107 is the process of inspection of the pixel electrode (11) which is a subject of examination, and will have counted the 4th signal 115 4 times.
[0067] That is, the control section 107 sets up beforehand the count of an input of the 4th signal 115 of each pixel electrode unit which is a subject of examination by expression news etc., and it becomes possible by carrying out the sequential count of the count of an input of the 4th signal 115 to shift to inspection of the pixel electrode (21) which is the following subject of examination, comparing with the count of an input corresponding to each pixel electrode. It depends for this count of an input on the location where each pixel electrode is arranged.
[0068] Next, inspection of the pixel electrode (21) which is a subject of examination is performed. First, a control section 107 checks having reached the count of an input (a pixel electrode (11) 4 times) set up beforehand about a pixel electrode (11), and performs inspection of the pixel electrode (21) which is a subject of examination.
[0069] First, this impresses the 3rd signal 113 to the potential sensor 22 which carries out location opposite at a pixel electrode (21), and a control section 107 is impressing the 2nd signal 111 to a pixel electrode (21).
[0070] Inspection of the existence of an open circuit of the pixel electrode (21) itself and the existence of the pixel inter-electrode short circuit which adjoins a pixel electrode (21) will be performed about inspection of the pixel electrode (21) which is a subject of examination as well as inspection of a pixel electrode (11), and a case.
[0071] It performs about the pixel electrode of the n directions of b of the arrow head which shows the above-mentioned inspection to drawing 6 . In addition to the count of an input of the 4th signal 115 of the pixel electrode unit mentioned above, a control section 107 counts the count of an accumulation input of the number of pixel electrodes (train unit) for one train (n pieces) here.
[0072] Then, the count of an accumulation input of a train unit is set up beforehand, the 4th signal 115 inputted into the last for one train is answered, and the potential sensor section 207 and a liquid crystal panel 6 output the 1st signal 109 for making it move relatively by one train. The count of an accumulation input of this train unit can respond by adding to the expression news which should store the count of an input of each previous pixel electrode unit etc.
[0073] The procedure of inspection mentioned above is as follows. First, the pixel electrode which is a current subject of examination, or the pixel electrode contiguous to this pixel electrode carries out a sequential response at the 2nd signal 111, and the pixel electrode which is a subject of examination is made to produce a pixel electrical potential difference one by one.
[0074] In the Banking Inspection Department 101, the potential sensor which carries out location opposite at the pixel electrode which is a subject of examination answers at said 3rd signal 113, and carries out sequential detection of the pixel electrical potential difference by the electrostatic coupling using an FET function. And in the Banking Inspection Department 101, the sequential output of the 4th signal 115 which shows the inspection report of the pixel electrode which is a subject of examination is carried out.
[0075] Then, according to the count of an input of the pixel electrode unit set up beforehand, a control section 107 answers the 4th signal 115, and carries out the sequential output of the 2nd signal 111 to the

pixel electrode which is the following subject of examination, or the pixel electrode contiguous to a pixel electrode. Moreover, to the potential sensor which carries out location opposite, the 3rd signal 113 is outputted to the pixel electrode which is the following subject of examination.

[0076] The above procedure is performed to the pixel electrode of the direction of a train, and according to the count of an accumulation input of the train unit set up beforehand, the 4th signal 115 is answered, the 1st signal 109 is outputted, and it shifts to inspection of the pixel electrode held in the following train in operating a mechanical component 105.

[0077] This inspection routine enables it to inspect the liquid crystal panel 6 which holds the total number nxm individual of pixel electrodes by scanning the potential sensor section 207 which is the Banking Inspection Department 101 or its part in the direction of a of an arrow head.

[0078] In addition, although duplication is included with the gestalt of this operation in the shunt evaluation of the pixel electrode which is a subject of examination, it is also possible to perform inspection which avoids the duplication in shunt evaluation.

[0079] It is controlling not to perform impression of the pulse voltage to a pixel electrode (11) in the case of the shunt evaluation of the pixel electrode (21) which are after the shunt evaluation by this impressing a pulse voltage (the 2nd signal 111) to a pixel electrode (21) in the case of the shunt evaluation of the pixel electrode (11) which is a subject of examination, next a subject of examination.

[0080] Moreover, although only the number corresponding to the pixel electrode for a vertical single tier in a liquid crystal panel 6 (n pieces) shall have held potential sensor 1N (integer of N1-n) with the gestalt of this operation as the potential sensor section 207 is shown in drawing 4 or drawing 6 It is also possible to hold the potential sensor corresponding to the pixel electrode for a horizontal single tier (m pieces) similarly, and to inspect in the direction of b shown in drawing 6 .

[0081] It is also possible to control by total pixel several n electrode xm to classify into two or more fields the field of the pixel electrode in a liquid crystal panel 6 by which matrix arrangement was carried out, to have only a number applicable to the field potential sensor section 207, and to scan only the field for inspection.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The inspection approach of the electrode structure for thin displays which detects the pixel electrical potential difference which is made to carry out the electrostatic coupling of the potential sensor which has field-effect transistor ability to each of two or more pixel electrodes, and is produced in said each electrode of a pixel, and is characterized by judging the abnormalities of said pixel electrode based on said detected pixel electrical potential difference.
[Claim 2] Test equipment which enforces the inspection approach of the electrode structure for thin displays according to claim 1 characterized by connecting to amplifier one or more potential sensors which detect the pixel electrical potential difference produced in said pixel electrode using the electric field effect TORAJISUTA function which carries out an electrostatic coupling to a pixel electrode, and coming to connect said amplifier with a scanner.
[Claim 3] In the Banking Inspection Department for inspecting the electrode structure for thin displays, and said Banking Inspection Department Two or more potential sensors using an FET function are arranged, and answer the 1st signal, and where the 1st spacing is held, said electrode structure for thin displays, and said some of Banking Inspection Department [at least] The mechanical component for making it move relatively and said electrode structure for thin displays about arrangement of a pixel electrode Said pixel electrode by which matrix arrangement is carried out is held in a n line m train (n and m are the natural number). Moreover, the orientation of two or more of said potential sensors, The line or the direction of a train in said matrix arrangement of said pixel electrode is in agreement, and the 4th signal which shows the inspection report of the pixel electrode which is a subject of examination is answered. The 2nd signal which outputs said 1st signal, and indicates an inspected initiation instruction to be said electrode structure for thin displays when said some of Banking Inspection Department [at least] moves relatively by one line or 1 train, Consist of the control section for outputting the 3rd signal which shows an inspection initiation instruction, and the pixel electrode which is the present subject of examination, or the pixel electrode contiguous to said pixel electrode by carrying out a sequential response to said 2nd signal Produce a pixel electrical potential difference one by one in said pixel electrode which is the present subject of examination, and the present potential sensor which carries out location opposite answers said pixel electrode which is said present subject of examination at said 3rd signal. Carry out sequential detection of said pixel electrical potential difference using an electrostatic coupling, carry out the sequential output of said 4th signal which shows the inspection report of the pixel electrode which is the present subject of examination, and said control section answers said 4th signal. Test equipment of the electrode structure for thin displays characterized by outputting said 2nd signal to the pixel electrode which is degree subject of examination, or the pixel electrode contiguous to said pixel electrode, and outputting said 3rd signal to the pixel electrode which is said degree subject of examination to the potential sensor which carries out location opposite.
[Claim 4] It is test equipment of the electrode structure for thin displays characterized by to consist of the amplifier for said potential sensor being equipped with the gate electrode for detecting the pixel electrical potential difference produced in a pixel electrode, and outputting a potential sensor signal to

the potential sensor using an FET function, and here by connecting electrostatic [which carry out location opposite with this potential sensor / the pixel electrode and electrostatic], amplifying said potential sensor signal, and outputting an amplifier signal.

[Translation done.]